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Title: WEATHER-RESISTANT RESIN-COATED METAL PLATE

[Claims]

1. A weather-resistant resin-coated metal plate formed by sequentially stacking an acrylic resin film (3) and a colored resin film (4) colored by a pigment added thereto on a base metal plate (1) via an adhesion layer (2), followed by integration, characterized in that the acrylic resin film (3) and the colored resin film (4) satisfy the following conditions:

a. the acrylic resin film (3) has an elongation at break within a range of 150 to 500% both in the flow direction (MD) upon film formation and in the direction (TD) orthogonal to the flow as measured according to JIS K 7127 at an ambient temperature of 23°C and a tension speed of 200 mm/min;

b. the colored resin film (4) is a film made of a mixture of a polyvinylidene-fluoride(PVdF)-based resin and an acrylic resin; is configured to be made entirely of a layer (4a) including 60 to 90 parts by weight of a PVdF-based resin and 40 to 10 parts by weight of an acrylic resin (the total of the two being 100 parts by weight) or to include at least one such layer (4a); and has, when the film is thus configured and has a thickness where actual coating is performed, an elongation at break within 100% or more both in the flow direction (MD) upon film formation and in the direction (TD) orthogonal to the flow as measured according to JIS K 7127 at an ambient temperature of 23°C and a tension speed of 200 mm/min.

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2. The weather-resistant resin-coated metal plate according to Claim 1, wherein the colored resin film (4) includes at least one layer (4a) that is a mixture of 60 to 90 parts by weight of a polyvinylidene-fluoride(PVdF)-based resin and 40 to 10 parts by weight of an acrylic resin (the total of the two being 100 parts by weight) and at least one layer (4b) that is a mixture of 10 to 40 parts by weight of a polyvinylidene-fluoride(PVdF)-based resin and 90 to 60 parts by weight of an acrylic resin (the total of the two being 100 parts by weight).

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## PATENT ABSTRACTS OF JAPAN

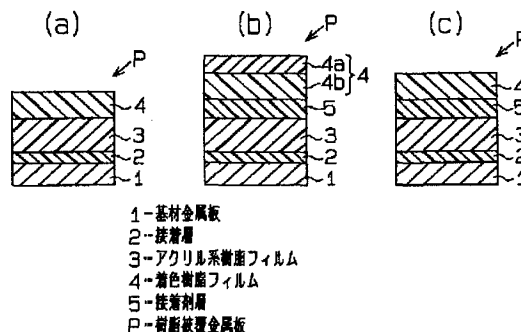
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### (54) WEATHERABLE RESIN COATED METAL PANEL

#### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a weatherable resin coated metal panel for outdoor use excellent in weather-resistant property and processability.

**SOLUTION:** The weather-resistant resin coated metal panel P is constituted by successively laminating an adhesive layer 2, an acrylic resin film 3 and a colored resin film 4 on a base material metal panel 1 to integrated them with the metal panel. The tensile elongation at break of the acrylic resin film 3 measured at an atmospheric temperature of 23.deg.C and a tensile speed of 200 mm/min according to JIS K 7127 is 150-500%, in both of the flow direction (MD) at the time of formation of the film and the direction(TD) crossing the flow direction at a right angle. The colored resin film 4 comprises a blend of a PVdF type resin and an acrylic resin and the whole thereof comprises a composition consisting of 60-90 pts.wt. of the PVdF type resin and 40-10 pts.wt. of the acrylic resin and contains at least one layer 4a of this composition. The tensile elongation at break of the colored resin film in an actually coated thickness measured under the above mentioned measuring condition is 100% or more in both of the flow direction (MD) at the time of formation of the film and the direction(TD) crossing the flow direction at a



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right angle.

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## Claims

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### [Claim(s)]

**[Claim 1]** On a base metal board (1), via a glue line (2) An acrylic resin film (3), Weatherproof resin cladding which is a resin coating metal plate of composition of having laminated a coloring resin film (4) which added paints and was colored one by one, and having unified, and is characterized by said acrylic resin film (3) and a coloring resin film (4) fulfilling the following conditions.

Based on JIS K 7127, an acrylic resin film (3) a. 23 \*\* of ambient temperature, Tension elongation after fracture measured by a part for 200-mm/in tension speed is 150 to 500% of range about a flow direction at the time of film production of a film (MD), and both directions of a direction (TD) which intersects perpendicularly with a flow.

b. A coloring resin film (4) is a film which comprises a blended body of polyvinylidene fluoride (PVdF) system resin and acrylic resin, With composition which the whole comprises a layer (4a) which are 60 to PVdF system resin 90 weight section, and 40 to acrylic resin 10 weight section (both sum totals are 100 weight sections), or contains said at least one layer of layers (4a). And tension elongation after fracture measured based on JIS K 7127 in thickness covered to the actual condition in this composition by a part for 200-mm/in 23 \*\* of ambient temperature and tension speed is not less than 100% about both directions of a direction (TD) which intersects perpendicularly with a flow direction (MD) and a flow of the time of film production of a film.

**[Claim 2]** A layer (4a) in which said coloring resin film (4) is a blended body (both sum totals are 100 weight sections) of the polyvinylidene fluoride (PVdF) system resin 60 - 90 weight sections, and the acrylic resin 40 - ten weight sections, The weatherproof resin cladding according to claim 1 which contains at a time at least one layer of layers (4b) which are a blended body (both sum totals are 100 weight sections) of ten to polyvinylidene fluoride (PVdF) system resin 40 weight section, and 90 to acrylic resin 60 weight section.

**[Claim 3]** An adhesives layer (5) is provided between said acrylic resin film (3) and a coloring resin film (4), And the weatherproof resin cladding according to claim 1 or 2 whose measured value of ultraviolet-rays cover nature in the range of 280-400-nm wavelength measured by one half of thickness of thickness covered to the actual condition of said coloring resin film (4) is not less than 80%.

## Detailed Description

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### [Detailed Description of the Invention]

[0001]

**[Field of the Invention]** This invention relates to the weatherproof resin cladding used for an outdoor type way, for example, and relates to the weatherproof resin cladding which does not use VCM/PVC system resin in detail.

[0002]

**[Description of the Prior Art]** Although the metal plate with which the weatherability of fluororesin etc. performed baking finish of the very good resinous principle as a resin coating metal plate used for an outdoor type way, or the metal plate which laminated the fluororesin film is used, The VCM/PVC system resin coating metal plate is also widely used as an object for outer layers.

[0003] This is because it excelled in compatibility with various additive agents and examination of weatherability improvement over many years has been performed, though VCM/PVC system resin itself is the material inferior to weatherability. And in absolute weatherability, although it is less than fluororesin, when performance is compared with cost, a VCM/PVC system resin coating metal plate can be said to be the dramatically outstanding sheathing material.

[0004] The VCM/PVC system resin coating metal plate has been the feature that excelling in the corrosion resistance of the part containing a crack and a thing [ processability ] are also big. Namely, by the baking finish of fluororesin, since the coat thickness which can be applied at once receives restriction, it has usually been to perform several spreading, but. A thickness of about tens of micrometers is common, a possibility that entering [ coat / after the time of processing bending etc. by this thickness, the time of construction, or construction ] a crack will reach a metal surface is high, and the corrosion resistance of the part containing a crack still poses a problem.

[0005] on the other hand -- a VCM/PVC system resin coating metal plate -- the thickness of a resin layer -- 100 several 10- even if it is common that there are about hundreds of micrometers and some cracks enter, it stops at the portion of a resin layer, and a possibility that a crack will reach a metal surface is reduced substantially. Since the pliability of a resin layer is high, it is the point which was excellent also in not producing the phenomenon of reducing corrosion resistance, such as a crack and a crack, about the portion which performed bending work etc., either.

[0006] In fluororesin film covering, covering thickness is the same as that of the case of a coat from a point of cost, and the problem containing a crack is not avoided too. Thus,

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although fluoro-resin cladding and a VCM/PVC system resin coating metal plate have the strong point and demerit, respectively, As a thing having these strong points of character, the resin coating metal plate of the composition which laminated the films colored on the VCM/PVC system resin layer with the inorganic pigment with good weatherability, such as acrylic resin and fluoro-resin, or composition of having provided the coating layer is put in practical use. When fluoro-resin, acrylic resin, etc. which were colored are located in the outside-surface side in this composition, A VCM/PVC system resin layer is protected from ultraviolet rays, and, in addition to much more improvement in weatherability being expectable, the problem of entering [ which poses a problem with a fluoro-resin coating metal plate ] a crack is also avoided by having hundreds of micrometers as total thickness of a resin layer.

**[0007]**When a flexible VCM/PVC system resin layer intervenes with thickness between metal plates also in a resin layer with a fluorine system, hard acrylic coat or film, etc., It is also one of the features of this composition that the flow stress at the time of bending work is eased by VCM/PVC system resin, and to some extent good processability is obtained.

**[0008]**

**[Problem to be solved by the invention]**However, the thing for which the problem of the heavy metal compound used as stabilizer of VCM/PVC system resin and the phthalic ester which are used as a plasticizer have the suspicion of an endocrine disruption operation (environmental hormone operation) in recent years, VCM/PVC system resin receives restrictions in the use from the environmental sides, like it is one of the substances which may generate dioxin depending on generating hydrogen chloride gas at the time of combustion, or burning conditions increasingly.

**[0009]**Although it is thought that using VCM/PVC system resin for the use which has the above long-term endurance acts in the direction which reduces an environmental impact, in an interior building material use or a household appliance use, use of a VCM/PVC system resin coating metal plate is certainly decreasing. Therefore, continuing production of a VCM/PVC system resin sheet only for the above-mentioned composition of a sheet maker is becoming a situation which is not efficient.

**[0010]**While this invention is made in view of the aforementioned problem, and the purpose is mainly used outdoors and excelling in weatherability and processability, it is in providing the resin coating metal plate which does not contain VCM/PVC system resin.

**[0011]**

**[Means for solving problem]**In order to attain the aforementioned purpose, in the invention according to claim 1. It is a resin coating metal plate of composition of having laminated the acrylic resin film and the coloring resin film which added paints and was colored one by one,

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and having unified via the glue line, on the base metal board, and said acrylic resin film and a coloring resin film fulfill the following conditions.

**[0012]**a. An acrylic resin film is 150 to 500% of range about the both directions of a direction (TD) where the flow direction (MD) and flow of the time of film production of a film, and tension elongation after fracture measured based on JIS K 7127 by a part for 200-mm/in 23 \*\* of ambient temperature and tension speed crosses at right angles.

**[0013]**b. A coloring resin film is a film which comprises the blended body of polyvinylidene fluoride (PVdF) system resin and acrylic resin, With the composition which the whole comprises a layer which are 60 to PVdF system resin 90 weight section, and 40 to acrylic resin 10 weight section (both sum totals are 100 weight sections), or contains said at least one layer of layers. And the tension elongation after fracture measured based on JIS K 7127 in the thickness covered to the actual condition in this composition by a part for 200-mm/in 23 \*\* of ambient temperature and tension speed is not less than 100% about the both directions of the direction (TD) which intersects perpendicularly with the flow direction (MD) and flow of the time of film production of a film.

**[0014]**Therefore, in this invention, since the open air side surface of a resin coating metal plate is covered with the good coloring resin film of weatherability, it can solve the problem of degradation of the surface or change of gloss accompanying advance of exposure, and its weatherability improves. Good processability is obtained, even if the elongation after fracture of an acrylic resin film and a coloring resin film does not use VCM/PVC system resin in the state of a resin coating metal plate because it is in the specific range. A glue line is formed with adhesives or a binder.

**[0015]**In the invention according to claim 2, in the invention according to claim 1, said coloring resin film, The layer which is a blended body (both sum totals are 100 weight sections) of 60 to polyvinylidene fluoride (PVdF) system resin 90 weight section, and 40 to acrylic resin 10 weight section, It contains at a time at least one layer of layers which are a blended body (both sum totals are 100 weight sections) of ten to polyvinylidene fluoride (PVdF) system resin 40 weight section, and 90 to acrylic resin 60 weight section.

**[0016]**Therefore, in this invention, it has the feature which can carry out laminate integration of a coloring resin film and the acrylic resin film easily in the contact (what is called a doubling method) to a short-time heating roller, etc., with the weatherability maintained in which the open air side surface of a resin coating metal plate is good in addition to the feature of invention of Claim 1.

**[0017]**In the invention according to claim 1 or 2 by the invention according to claim 3, The measured value of the ultraviolet-rays cover nature in the range of 280-400-nm wavelength measured by one half of the thickness of the thickness which an adhesives layer is provided

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between said acrylic resin film and a coloring resin film, and is covered to the actual condition of said coloring resin film is not less than 80%.

**[0018]**Therefore, in this invention, in addition to the feature of invention of Claim 2, the adhesives layer which is generally easy to produce exfoliation by weather resistance deterioration is protected from ultraviolet rays, and long-term peeling resistance is acquired.

**[0019]**

**[Mode for carrying out the invention]**Hereafter, the embodiment which materialized this invention is described based on Drawings. Drawing 1 (a) is a type section figure showing the basic constitution of the weatherproof resin cladding (a resin coating metal plate is only called hereafter) P of this invention. The resin coating metal plate P has the composition that the glue line 2 was laminated by one side of the base metal board 1, and the acrylic resin film 3 was laminated on it, and also the coloring resin film 4 was laminated on it.

**[0020]**In the resin coating metal plate P shown in drawing 1 (b), the thing of composition of that the layers 4a and 4b which consist of two kinds of resin films in which presentations differ as the coloring resin film 4 were laminated is used. According to this embodiment, one layer (layer by the side of an outside surface) 4a comprises the blended body of 60 to polyvinylidene fluoride (PVdF) system resin 90 weight section, and 40 to acrylic resin 10 weight section (both sum totals are 100 weight sections). The layer 4b of another side comprises the blended body of ten to PVdF system resin 40 weight section, and 90 to acrylic resin 60 weight section (both sum totals are 100 weight sections).

**[0021]**In the resin coating metal plate P shown in drawing 1 (c), the adhesives layer 5 is formed between the acrylic resin film 3 and the coloring resin film 4. The coloring resin film 4 is not less than 80% by the method in which the measured value of the ultraviolet-rays cover nature in the range of 280-400-nm wavelength measured by one half of the thickness of the actually covered thickness carries out a postscript.

**[0022]**As the <base metal board 1> base metal board 1, the metal plate generally used as a base material of a resin coating metal plate is used, For example, a hot-dip zinc-coated steel sheet, an electro-galvanizing steel plate, aluminum and a zinc composite plating steel plate (5% aluminum and a zinc composite plating steel plate, 55% aluminum and a zinc composite plating steel plate), an aluminum galvanized steel sheet, a stainless steel plate, an aluminum system alloy plate, etc. are mentioned. These metal plates do not have restriction in particular within general limits about board thickness, a heat treatment condition, the thickness of plating, etc. The usual processings, such as phosphate chemical conversion and chromate treatment, can be performed also about the surface treatment of a metal plate.

**[0023]**As adhesives which can be used for the glue line 2 which intervenes between the <glue line 2> base metal board 1 and the acrylic resin film 3, Acrylic adhesives, urethane

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system adhesives, acrylic urethane system adhesives, epoxy adhesive, phenol system adhesives, amide system adhesives, polyester system adhesives, etc. can be mentioned. Since the film laminated on the glue line 2 comprises acrylic resin, acrylic adhesives can be preferably used also in these adhesives. However, adhesives are not limited to what was these-illustrated.

**[0024]**The method of spreading and baking of adhesives can also use without restriction the method generally used to manufacture of a resin coating metal plate. After applying continuously by a roll coater on the steel plate coil which began to roll the adhesives which dissolved in the solvent as an example, the method of carrying out lamination adhesion of the resin film, etc. can be mentioned to the drying furnace installed with in-line one, and the steel plate immediately after printing subsequently, introducing into a furnace and coming out of a baking furnace.

**[0025]**The glue line 2 may use not adhesives but a binder for lamination of what [ not only ] not necessarily comprises adhesives but the base metal board 1, and the acrylic resin film 3. As a binder which can be used, publicly known things, such as acrylic and a silicone series, can be mentioned.

**[0026]**The acrylic resin used for the <acrylic resin film 3> acrylic resin film 3, It is what is contained under the category of the acrylic resin generally called a "pliability acrylic", a "film grade acrylic", or a "soft acrylic", A cross linked acrylic rubber elastic body ingredient is used as a core, and it is based on the what is called core shell type copolymer composition thing produced by carrying out the graft polymerization of the acrylic ester (meta) system resin. A bridge construction elastic body ingredient makes a subject resin of an acrylic ester system whose glass transition temperature, such as butyl acrylate and ethylhexyl acrylate, is lower than 0 \*\*, and is giving the structure of cross linkage by carrying out copolymerization of the ethylene glycol dimethacrylate etc.

**[0027]**graft polymerization is carried out to this bridge construction elastic body, and what comprises a presentation which made methyl methacrylate a subject and carried out random copolymerization of the other acrylic ester (meta-) system resin, such as butyl acrylate, as a material which forms a shell phase (matrix phase) of acrylic resin is used.

**[0028]**It is indicated by JP,S48-36947,A, JP,S53-64228,A, JP,S57-146652,A, etc. about a polymerization method and composition of this pliability acrylic.

**[0029]**In a use (overlay) etc. which are covered to a VCM/PVC system resin coating metal plate also in these pliability acrylic, Most presentations of a shell phase are made into methyl methacrylate from the purpose of obtaining the weatherability of the film itself first, A two or more layers layer which comprises the purpose of prevention from a white blush mark at the time of bending or the purposes, such as refractive-index adjustment for securing

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transparency, from both interim presentation by multistage copolymerization between a bridge construction elastic body ingredient and a shell phase is provided, and many things which have taken complicated composition of changing a presentation in inclination can see.

**[0030]**In this invention, the acrylic resin film 3 does not need to consider ultraviolet rays-proof (lightfastness) specially from being protected from ultraviolet rays with the coloring resin film 4 colored by addition of paints. Since a white blush mark at the time of bending-proof does not actualize when the coloring resin film 4 similarly exists in the surface, the above complicated composition is not needed. In particular light transmission or a haze value of resin itself are not important, either, and a ratio of a cross linked acrylic rubber ingredient, etc. have arbitrary hot forming in the point in the range which does not become difficult.

**[0031]**What is included for rubber compositions and resinous principles other than cross linked acrylic rubber as an ingredient which gives pliability, Although it is not desirable in an overlay use, it is a range in which the weatherability (ultraviolet rays are mainly heat resistance since most is covered with the coloring resin film 4) is not remarkably reduced in this invention, and these may be included.

**[0032]**In order that important one may secure a moldability in a form of a resin coating metal plate in the acrylic resin film 3, it is having the pliability of a specific range. Pull the pliability of the acrylic resin film 3 and elongation after fracture prescribes this invention, Tension elongation after fracture measured based on JIS K 7127 by a part for 200-mm/in 23 \*\* of ambient temperature and tension speed is being in 150 to 500% of range about a flow direction at the time of film production of a film (MD), and both directions of a direction (TD) which intersects perpendicularly with a flow.

**[0033]**If a value of tension elongation after fracture is smaller than this, good processability cannot be obtained in laminated constitution and it is not desirable. If a value of tension elongation after fracture is larger than this, pliability in ordinary temperature becomes excessive, brings about aggravation of handling nature, a fall of surface hardness in laminated constitution, etc., and is not preferred. By specifying elongation after fracture of the acrylic resin film 3 to a mentioned range, it becomes possible to make secondary elaboration nature, such as roll-forming processing with composition of a resin coating metal plate, and press working of sheet metal, into a satisfaction \*\*\*\* thing.

**[0034]**Its range of 25-250 micrometers is preferred, and since the thickness of the acrylic resin film 3 will produce problems, such as a fall of the productivity as a film, and a fall of handling nature, if it is thinner than this, it is not preferred. When performing bending work to a resin coating metal plate, the stress of the modification added to the coloring resin film 4 laminated on this film 3 by easing The fracture of the coloring resin film 4, From the viewpoint of preventing entering a crack, and a viewpoint of avoiding the acrylic resin film 3 fracturing

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by bent part plating crack of the base metal board 1, it is preferred that there is a thickness of not less than 50 micrometers, and a thickness of not less than 75 micrometers is still more preferred. If thickness exceeds 250 micrometers, it is not realistic from the field of cost.

**[0035]**As for the acrylic resin film 3, it is preferred to add paints and to be colored. This is to keep the weatherability of the part containing a crack from falling remarkably by reducing the penetration depth of ultraviolet rays, also when entering a crack occurs selectively in the surface coloring resin film 4. In this case, if it colors by the coloring resin film 4 and an affiliated color, the effect which makes it not conspicuous to enter a crack will be acquired. Or conversely, when brightness and the chroma saturation of the coloring resin film 4 are low, discovery containing a crack is made easy and it may be made to enable early repair by coloring the acrylic resin film 3 in a color with high brightness and chroma saturation.

**[0036]**In the acrylic resin film 3, in addition to the aforementioned pigment component, an ultraviolet ray absorbent, Various additive agents, such as things added in order to raise the heat resistance of resin and weatherability generally, such as process stabilizer, such as light stabilizer, a radical scavenger, and an antioxidant, and a metal deactivator, and a thing by which processing aid, lubricant, and these other are also generally added for the purpose of the processability enhancement of resin, may be added.

**[0037]**It is not what provides especially restriction also about the film production method of the acrylic resin film 3, It can be based on general methods used for film production of a VCM/PVC system resin sheet, such as a T-die extrusion method, a tubular film process, or the calendar method, and the equipment used for film production of a VCM/PVC system resin sheet can be used as it is.

**[0038]**The film which comprises the blended body of polyvinylidene fluoride (PVdF) system resin and acrylic resin which combine very good weatherability and a certain amount of pliability as the coloring resin film 4 laminated by the acrylic resin film 3 of <coloring resin film 4> this invention is used. The film which comprises this blended body is based on JIS K 7127 in the actually covered thickness, The tension elongation after fracture measured by a part for 200-mm/in ambient temperature 23degreeC and tension speed is not less than 100% about the flow direction at the time of film production of a film (MD), and the both directions of the direction (TD) which intersects perpendicularly with a flow.

**[0039]**PVdF system resin makes a subject a homopolymer of vinylidene fluoride, or vinylidene fluoride, is copolymerization resin of this and other copolymerizable monomers, and has acrylic resin and compatibility. As acrylic resin blended with PVdF system resin, In addition to pliability acrylic resin, a polymethylmethacrylate (PMMA) homopolymer, Shock-proof acrylic resin which made methyl methacrylate a subject and which has a part for cross linked acrylic rubber of a small quantity relatively compared with a random copolymer with

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other copolymerizable monomer components and a pliability acrylic resin can be mentioned.

**[0040]** Although a PMMA homopolymer is most excellent in weatherability in these acrylic resin, A blend ratio which can give pliability to mixed material (coloring resin film 4) with PVdF system resin is limited to a narrow range, and it is preferred from the viewpoint to use pliability acrylic resin which has a certain amount of tension elongation after fracture originally. Especially, its simple substance also has the weatherability which is satisfactory practically, and the thing of a grade used for surface coating of a VCM/PVC system resin coating metal plate, etc. can use it preferably.

**[0041]** A vinylidene fluoride 6 fluoridation propylene copolymer and a fluoridation vinylidene-fluororubber copolymer which have pliability may be used as PVdF system resin. From a point which is located in the outermost surface of a resin coating metal plate, and is directly put to the atmosphere, it is desired for weatherability to be better and, as for the coloring resin film 4, it is preferred that a ratio of PVdF system resin in a blend presentation is high. When a ratio of PVdF system resin generally desires better processability by blend presentation of PVdF system resin and acrylic resin from a point that elongation after fracture good to mixed material is obtained in the range of 60 to 90 weight section, it is preferred to take a presentation of a homotype enclosure (a ratio of PVdF system resin is high). In this invention, since a layer of said range exists in a blend ratio of PVdF system resin and acrylic resin, good processability is obtained.

**[0042]** On the other hand, from an adhesive viewpoint with the acrylic resin film 3, it is preferred that a ratio of acrylic resin is high. When a ratio of acrylic resin in a blend presentation is 60 or more weight sections, a good adhesive property with an acrylic resin film can generally be acquired by laminate integration by contact (what is called a doubling method) to a short-time heating roller, etc.

**[0043]** A film which consists of two-layer [ from which a blend ratio of PVdF system resin and acrylic resin differs ] as what solves these conflicting requirements is marketed (DX-14 film: made by DENKI KAGAKU KOGYO K.K.), and it can use preferably as the coloring resin film 4 of this invention.

**[0044]** A ratio of PVdF system resin which is excellent in weatherability may form the adhesives layers 5, such as acrylic and denaturation acrylic, between the acrylic resin film 3 and the coloring resin film 4 as the coloring resin film 4 using a film of a blend presentation of 60 to 90 weight section. Also in this case, a good adhesive property can be acquired by contact of a short time to a heating roller.

**[0045]** When an outdoor exposure or an accelerated weathering test is generally presented with a resin film of laminated constitution, the thin adhesives layer 5 receives degradation by ultraviolet rays, and results in exfoliation temporally in many cases. However, in this

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invention, when forming the adhesives layer 5, exfoliation resulting from ultraviolet ray degradation of an adhesion interface can be prevented by making ultraviolet-rays cover nature of the coloring resin film 4 more than a specific value. Of course, when not forming the adhesives layer 5, the ultraviolet-rays cover nature of the coloring resin film 4 is not cared about as more than a specific value. However, when the coloring resin film 4 takes composition like said DX-14 film, The adhesion side side (layer 4b which consists of a blended composite of ten to PVdF system resin 40 weight section and 90 to acrylic resin 60 weight section), and the acrylic resin film 3 can be firmly pasted up by thermal melting arrival by the doubling method, Big influence is not received even if an adhesion interface is put to ultraviolet rays which have penetrated the coloring resin film 4. Therefore, it is not necessary to make ultraviolet-rays cover nature of the coloring resin film 4 more than a specific value.

**[0046]**About a method of laminate integration of the coloring resin film 4 and the acrylic resin film 3, Not by a thing specified as the describing [ above ] doubling method but by the continuation belt method etc. Comparatively for a long time by method of carrying out heat adhesion of the coloring resin film 4 and the acrylic resin film 3 of monolayer composition directly by heating and pressurizing, and a method or a co-extrusion method which similarly carries out laminate integration of the sheet article with a press. A method of carrying out laminate integration simultaneously at the time of film production, an extrusion lamination-ized method, etc. can be used.

**[0047]**The coloring resin film 4 is the actually covered thickness, and based on JIS K 7127 23 \*\* of ambient temperature, It is required for tension elongation after fracture measured by a part for 200-mm/in tension speed to have not less than 100% of value about both directions of a direction (TD) which intersects perpendicularly with a flow direction (MD) and a flow of the time of film production of a film, and not less than 150% of elongation after fracture is still more preferred.

**[0048]**However the acrylic resin film 3 flexible as a layer which eases stress at the time of modification may be formed, if coloring resin film 4 the very thing is not the material which has elongation to some extent, either, this cannot follow in footsteps of modification at the time of bending work, but will be because it results in a fracture of a film, or generating of a crack. A maximum of tension elongation after fracture may change with thickness of the acrylic resin film 3, the pliability of this film 3, etc., and may change also by balance of importance of other characteristics and processability, such as surface hardness in laminated constitution. Actually, as for a maximum of elongation after fracture of a viewpoint of such problems and costs to the coloring resin film 4, it is preferred to consider it as about 300%.

**[0049]**The ranges of the desirable thickness of the coloring resin film 4 are 20 micrometers - 100 micrometers, and it is not preferred from becoming difficult for the handling nature as a

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film to worsen, if thickness is thinner than this, and to secure predetermined ultraviolet-rays cover nature also by abundant addition of paints. If thicker than this, in order to use expensive PVdF system resin so much, it becomes a high cost and is not desirable.

**[0050]**When the adhesives layer 5 is formed between the coloring resin film 4 and the acrylic resin film 3, It is required for the measured value of the ultraviolet-rays cover nature in the range of 280-400-nm wavelength measured by the specific method to be not less than 80% by one half of the thickness of the thickness covered to the actual condition of the coloring resin film 4.

**[0051]**The optimum sensitivity of transmissivity of this is 0.01% (it is 4.0 at an absorbance coefficient) of spectrophotometer, When the cover nature of an ultraviolet-rays region is compared about the coloring resin film 4 of the actually covered thickness, about two sorts of things accepted to be in the level of sufficient cover nature, The same adhesives layer 5 is given, and when laminate integration is carried out to the same acrylic resin film 3 and an exposure examination is presented, it is based on the knowledge which brought a result to which a difference appears in the deterioration condition (fall of adhesive strength) of the adhesion side containing the adhesives layer 5.

**[0052]**Then, even if there is no difference in the measured value in the actually covered thickness, the difference in the transmission quantity of the weak ultraviolet rays below the detection sensitivity limit of a measuring instrument thinks that it is affected between prolonged exposure, When ultraviolet-rays cover nature is measured by one half of the thickness of the actually covered thickness, a difference is accepted about two sorts of coloring resin films 4, and this brings a result correlated with the difference in the deterioration condition of the adhesion side containing the adhesives layer 5. When the ultraviolet-rays cover nature in one half of thickness is less than 80%, ultraviolet ray degradation is produced in the adhesives layer 5 in prolonged exposure, and it is not desirable.

**[0053]**The "ultraviolet-rays cover nature" as used in the field of this invention is specified as follows, and is measured by the following methods. As a spectrophotometer, light transmission uses the thing (Hitachi Mold as an example "U-3200") of 0.01% (it is 4.0 at an absorbance coefficient) of the optimum-sensitivity transmissivity displayed with logarithmic scale. And as shown in drawing 5 (a) among the absorption waveforms measured by this, the area A formed of the portion equivalent to an ultraviolet-rays region with a wavelength of 280-400 nm is determined. On the other hand, as shown in drawing 5 (b), when it is considered as the area B in case transmissivity is 0.01% or less throughout this wavelength band, what indicated the ratio of the area A and the area B by percentage is defined as ultraviolet-rays cover nature.

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**[0054]**

Ultraviolet-rays cover nature (%) When transmissivity is 1% throughout  $=(\text{area A})/(\text{area B}) \times 100$ , therefore this wavelength, as shown in drawing 5 (c), the area A will be set to one half of the area B, and will be ultraviolet-rays cover nature =50%. Throughout this wavelength, if transmissivity is 0.1%, it will be ultraviolet-rays cover nature =75% at a flat.

**[0055]**in addition -- being related with the permeability of light generally -- a Lambert-Beer rule (an  $A=ExCL$ :A= absorbance.) Since E= proportionality constant, C= bulking agent concentration, and L= sample path length are realized, when there is almost no 280-400-nm absorption in the resin material itself like acrylic resin or fluororesin, It may replace with the method of measuring ultraviolet-rays cover nature using the film of one half of the thickness of the actually covered thickness, and ultraviolet-rays cover nature may be measured using the film which made the kind of paints the same and set only the addition to one half. When the measuring instrument of as [ whose optimum-sensitivity transmissivity is 0.000001% (it is 8.0 at an optimum-sensitivity absorbance coefficient) ] is obtained, it is measurement by the thickness covered to the actual condition of the coloring resin film 4, and is good also as not less than 80% of ultraviolet-rays cover nature.

**[0056]**Although this of a procedure of obtaining composition of the resin coating metal plate P of <manufacture procedure of resin coating metal plate> this invention is also arbitrary, laminate integration of the coloring resin film 4 and the acrylic resin film 3 may already be carried out within a dice of an extruder by a co-extrusion method. After producing either as a film, it may laminate by the extrusion laminating method, Or after the coloring resin film 4 and the acrylic resin film 3 are independently fabricated as a sheet, it may laminate by the doubling method, what is called the continuation belt method for passing between steel band belts which have a heating zone and a cooling zone, a method of pressing a batch method, etc.

**[0057]**Although a procedure which carries out adhesion lamination of the sheet by which laminate integration was carried out by these methods at the base metal board 1 which printed acrylic adhesives etc. is common, after carrying out adhesion lamination only of the acrylic resin film 3 on the base metal board 1, laminate integration of the coloring resin film 4 may be carried out. The glue line 2 may consist of what is called binders instead of adhesives.

**[0058]**(EXAMPLE) An embodiment explains this invention in more detail hereafter. Each sample used for <creation of resin coating metal plate> embodiments 1-11 and the comparative examples 1-10 was created by the following methods.

**[0059]**1-1 <Base metal board 1> A molten zinc plating steel plate which performed 450-micrometer-thick surface phosphating was used about all sample.

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**[0060]**1-2 <Glue line 2> The same heat cure type acrylic adhesives were used about all sample.

1-3 Acrylic raw materials or such mixed material of marketing shown in the <acrylic resin film 3> table 1 were used, and an acrylic resin film of a presentation shown in Table 2 was created, and it was used for each embodiment and a comparative example.

**[0061]**A method of film-izing supplies a pellet and an additive component of a pliability acrylic with a separate fixed-quantity feeder to one set of a phi25-mm said direction 2 axis kneading machine, It extrudes from a strand die, and cuts by a pelletizer installed in in-line one, and an acrylic resin pellet which scoured an additive component is formed. And this is supplied to phi40-mm monopodium screw extruder, and it is considered as a 100-micrometer-thick film by extruding from a T die.

**[0062]**An additive component makes the total quantity of a resinous principle 100 weight sections, and Titanium oxide pigment 15 weight section, It was presupposed by KIMASOBU 944LD(HALS (hindered amine light stabilizer): Tiba Speciality Chemicals) 0.4 weight section and IRUGA NOx HP-2921 (multicomputer-system process stabilizer: Tiba Speciality Chemicals) 0.4 weight section that it is the same by all the samples.

**[0063]**

**[Table 1]**

呼称	アクリル樹脂原料
アクリルA	パラペットGR-F (クラレ)
アクリルB	パラペットSA (クラレ)
アクリルC	メタブレンW-377 (三菱レイヨン)
アクリルD	メタブレンH-660 (三菱レイヨン)

**[0064]**

**[Table 2]**

呼称	原料ブレンド比率（重量部）	方向	張り破断伸び（％）
c-1	アクリルB 100	MD TD	552 520
c-2	アクリルA：アクリルB 10：90	MD TD	507 485
c-3	アクリルA：アクリルB 20：80	MD TD	445 406
c-4	アクリルA：アクリルB 30：70	MD TD	372 379
c-5	アクリルA：アクリルB 40：60	MD TD	287 298
c-6	アクリルA：アクリルB 50：50	MD TD	220 207
c-7	アクリルA：アクリルB 70：30	MD TD	151 162
c-8	アクリルA：アクリルB 90：10	MD TD	124 131
c-9	アクリルA 100	MD TD	91 113
c-10	アクリルB：アクリルC 50：50	MD TD	342 334
c-11	アクリルB：アクリルC 30：70	MD TD	289 252
c-12	アクリルB：アクリルC ：アクリルD 40：50：10	MD TD	213 186
c-13	アクリルC：アクリルD 70：30	MD TD	122 81

\*引張り破断伸びは、JIS K-7127に準拠して23℃で測定

\*これらの測定値は、あくまで特定の顔料添加での特定の製法で得られたシートのものであり、各メーカーの樹脂物性を表すものではない。

1-4 About <coloring resin film 4> each embodiment and a comparative example, the coloring resin film shown in Table 3 was used. Denker DX-14 coloured film is a commercial item (made by DENKI KAGAKU KOGYO K.K.), and is the 40-micrometer-thick monolayer film or the 50-micrometer-thick two-layer co-extrusion film created by the extrusion method about other films.

**[0065]**The Denker DX-14 coloured film is colored by the paints of a multiple oxide system, and an iron oxide system brown pigment and carbon black colored other films. Only the coloring resin film 4 used for the comparative example 6 reduces a paints addition, and has made ultraviolet-rays cover nature lowness. As for the open air and adhesion side side, about the film of multilayered constitution, each presentation was shown in Table 3.

**[0066]**The preparation method of the monolayer film was the same as that of the case of an outline and an acrylic resin film, in addition to phi40-mm monopodium screw extruder, phi30-mm monopodium screw extruder was used, and creation of the two-layer film was performed

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by the feed block joining method.

[0067]The sample for ultraviolet-rays cover nature measurement sped up the number of rotations of the casting roll in what was created by extrusion film production, and extracted a 25-micrometer film with 20 micrometers and a two-layer co-extrusion film with the monolayer film.

[0068]About Denker DX-14 film, simple uniaxial-stretching equipment performed extension twice, and it was considered as the test portion.

[0069]

[Table 3]

		厚み μ m	構成、 ブレンド組成	引張り 破断伸び	紫外線 遮蔽率
d-1	デンカ DX-14 フィルム ライト グレー	40	外気側 PVdF (80) : AC (20)	MD=203%	99%
			接着側 PVdF (20) : AC (80)	TD=215%	
d-2	デンカ DX-14 フィルム ダーク ブラウン	40	外気側 PVdF (80) : AC (20)	MD=207%	100%
			接着側 PVdF (20) : AC (80)	TD=182%	
d-3	試作単層 フィルム	40	PVdF (80) アクリル A (20)	MD=233% TD=257%	89%
d-4	試作単層 フィルム	40	PVdF (80) アクリル A (20)	MD=285% TD=262%	76%
d-5	試作単層 フィルム	40	PVdF (20) アクリル A (80)	MD=143% TD=161%	91%
d-6	試作単層 フィルム	40	アクリル A (100)	MD=114% TD=122%	90%
d-7	試作単層 フィルム	40	アクリル A (30) アクリル B (70)	MD=316% TD=335%	90%
d-8	試作 2 層 フィルム	10	外気側 PVdF (100)	MD= 97%	92%
		40	接着側 アクリル A (100)	TD= 83%	

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The number in a parenthesis of "the column of composition and a blend presentation" of Table 3 shows a blend ratio (weight section).

[0070]1-5 About the <laminate integration of coloring resin film and acrylic resin film> embodiments 1-11, and the comparative examples 1-10, By piling up the acrylic resin film 3 and the coloring resin film 4, and letting between the metallic roll heated by 140 \*\* and mold-release characteristic rolls pass, thermal melting arrival was carried out and it was considered as the laminated film. When the coloring resin film 4 is multilayered constitution, it piles up the adhesion side side.

[0071]At Embodiment 10, Embodiment 11, and the comparative example 6, they are denaturation acrylic adhesives (it has applied so that it may become the dried thickness of 3 micrometers about poly MENTO NK-380 (made by NIPPON SHOKUBAI Co., Ltd.)) to one side of the coloring resin film 4.

[0072]The combination of the coloring resin film 4 of an embodiment and a comparative example and an acrylic resin film was shown in Table 4.

[0073]

[Table 4]

	アクリル フィルム	着色樹脂 フィルム		アクリル フィルム	着色樹脂 フィルム
実施例 1	c - 3	d - 1	比較例 1	c - 1	d - 1
実施例 2	c - 4	d - 1	比較例 2	c - 2	d - 1
実施例 3	c - 5	d - 1	比較例 3	c - 8	d - 1
実施例 4	c - 6	d - 1	比較例 4	c - 9	d - 1
実施例 5	c - 7	d - 1	比較例 5	c - 13	d - 1
実施例 6	c - 10	d - 1	比較例 6	c - 5	d - 4
実施例 7	c - 11	d - 1	比較例 7	c - 5	d - 5
実施例 8	c - 12	d - 1	比較例 8	c - 5	d - 6
実施例 9	c - 5	d - 2	比較例 9	c - 5	d - 7
実施例 10	c - 5	d - 3	比較例 10	c - 5	d - 8
実施例 11	c - 10	d - 3			

1-6 While applying adhesives to the <creation of resin coating metal plate> base metal board 1 by the bar coating machine so that it might become the dried thickness of 5 micrometers, This text is a machine translation offered by JPO and INPIT.  
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and printing on it at 215 \*\*, the film which carried out laminate integration as mentioned above was laminated to the glue line of this \*\*\*\*\*, and was used as the resin coating metal plate.

**[0074]**[Evaluation of a resin coating metal plate]

2-1 Processability was evaluated about the resin coating metal plate of the <processability evaluation of resin coating metal plate> embodiments 1-11, and the comparative examples 1-10.

**[0075]**Various resin coating metal plates were cut in size of 40 mm x 60 mm, and evaluation of the shock adhesion bending method, the adhesion bending method (OT bending) specified to JIS Z-2248 "the metallic material bending test method", and the V-bending method was performed.

**[0076]**As shown in drawing 2 (a), a shock adhesion bending method carries out the resin coating side of the resin coating metal plate P outside, first, arranges the  $\phi 4$ mm metal round bars 7 inside, performs a 180-degree clinch preparatorily along the surface of the round bar 7, and obtains the specimen 8. Next, as shown in drawing 2 (b), where the specimen 8 is fixed to the metal bottom parts 9, free fall of the punch 10 of a 5-kg cylindrical shape is carried out from 35 cm in height, and adhesion bending (OT bending) is added to a resin coating metal plate. It carried out by 23 \*\* of ambient temperature.

**[0077]**By the adhesion bending method and a V-bending method, the screw bending test equipment 11 as shown in drawing 3 is used. The screw bending test equipment 11 is provided with the bottom part 9 and the punch 10. The punch 10 goes up and down by the manual operation of the operation handle 13 which was fixed to the lower end of the screw 12 movable to a sliding direction, and was fixed to the upper part of the screw 12.

**[0078]**In the adhesion bending method of JIS Z-2248, the specimen 8 into which reserve bending was performed and processed like the shock adhesion bending method is arranged on the metal bottom parts 9, as shown in drawing 4 (a), and it is pressed by the punch 10 which descends with a preparation screw, and adhesion bending (OT bending) is added. It carried out at 23 \*\* of ambient temperature, and 0 \*\*.

**[0079]**In the V-bending method of JIS Z-2248, as shown in drawing 4 (b), on the bottom part 9 with which V groove 9a with an angle of 90 degrees was formed, The plate-like specimen 8 is laid in the state where the resin coating side contacts a bottom part, and 90-degree bending is added because a tip drops the metal punches 10 processed into the angle (with no angle round-off) of 90 degrees corresponding to V groove 9a with a preparation screw and stuffs the specimen 8 into V groove 9a. It carried out at 23 \*\* of ambient temperature, and 0 \*\*.

**[0080]**after test termination, carry out visual observation and break the coating resin layer of

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a bend portion -- what a crack and exfoliation are not accepted to -- 20% or less of the width of "O" and a bend portion -- divide -- what a crack is accepted to -- "\*\*\*\*" and more than it -- divide -- the crack was accepted and the bad thing was made into "x" from "\*\*\*\*." The test result was shown in Table 5 and 6. All the results with three (n= 3) trial were shown in Table 5 and 6. Two points were counted for "O", one point and "x" were counted for "\*\*\*\*" as zero point, and it asked for the processability evaluation items of each sample. The result of the pencil hardness test by JISk-5401 was combined with Table 5 and 6, and was indicated.

**[0081]**2-2 <Weatherability accelerated test evaluation of resin coating metal plate> each resin coating metal plate was cut in size of 60 mm x 50 mm, and it was considered as the sample for weathering evaluation. Processing in particular of sealing of a cut section end face, etc. was not performed. These samples were supplied to the sunshine weather meter accelerated test machine (Made by Suga Test Instruments), and the exposure examination at the black panel temperature of 63 °C was done. To the sample of exposure 4000 hours, 8000 hours, and 12000 hours after, color difference change was measured with the color difference meter, and coated resin was exfoliated by viewing and slitting evaluation. When slitting evaluation twisted the edge of a cutter knife and had rolled up coated resin after it put in the cut which penetrates a resin coating layer with the cutter knife for clerical work, and arrives at a metal plate surface, it evaluated whether it would be generated by the float in coated resin. A result is shown in Table 7.

**[0082]**2-3 <Weatherability outdoor-exposure evaluation of resin coating metal plate> each resin coating metal plate was cut in size of 60 mm x 50 mm, and it was considered as the sample for weathering evaluation. Processing in particular of sealing of a cut section end face, etc. was not performed. These samples were installed in the outdoor-exposure stand (for south, the angle of inclination of 45 degrees from the level surface, a setting position: Nagahama-shi, Shiga), and the exposure examination for two years was done. By the outdoor exposure for about two years, exfoliation was observed in no samples of the embodiment and the comparative example as a result. Color difference change was measured in both the state which does not remove adhesion of the pollutant to the sample surface in exposure, and the state where the surface was lightly wiped by Wex who got dry. A result is shown in Table 8.

**[0083]**[The evaluation result of a resin coating metal plate]

3-1 <Processability evaluation result of a resin coating metal plate> [0084]

**[Table 5]**

		評価温度 23℃			評価温度 0℃		加工性 評価点	表面 硬さ
		90° V曲げ	180° 密着曲げ	衝撃密 着曲げ	90° V曲げ	180° 密着曲げ		
実施例 1	MD TD	○○○ ○○○	○○○ ○○○	○○○ ○○○	○○○ ○○○	○○○ ○○○	6 0	3 B
実施例 2	MD TD	○○○ ○○○	○○○ ○○○	○○○ ○○○	○○○ ○○○	○○○ ○○○	6 0	3 B
実施例 3	MD TD	○○○ ○○○	○○○ ○○○	○○○ ○○○	○○○ ○○○	○○○ ○○○	6 0	3 B
実施例 4	MD TD	○○○ ○○○	○○○ ○○○	○○○ ○○○	○○○ ○○○	○○△ △△△	5 7	2 B
実施例 5	MD TD	○○○ ○○○	○○○ ○○○	△△△ △△×	○○○ ○○○	△△△ △××	4 5	B
実施例 6	MD TD	○○○ ○○○	○○○ ○○○	○○○ ○○○	○○○ ○○○	○○○ ○○○	6 0	3 B
実施例 7	MD TD	○○○ ○○○	○○○ ○○○	○○○ ○○○	○○○ ○○○	○○○ ○○○	6 0	3 B
実施例 8	MD TD	○○○ ○○○	○○○ ○○○	○○○ ○○△	○○○ ○○○	○○△ ○○△	5 4	2 B
実施例 9	MD TD	○○○ ○○○	○○○ ○○○	○○○ ○○○	○○○ ○○○	○○○ ○○○	6 0	3 B
実施例 10	MD TD	○○○ ○○○	○○○ ○○○	○○○ ○○○	○○○ ○○○	○○○ ○○○	6 0	3 B
実施例 11	MD TD	○○○ ○○○	○○○ ○○○	○○○ ○○○	○○○ ○○○	○○○ ○○○	6 0	3 B

[0085]

[Table 6]

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powered by

		評価温度 23℃			評価温度 0℃		加工性評価点	表面硬さ
		90° V曲げ	180° 密着曲げ	衝撃密着曲げ	90° V曲げ	180° 密着曲げ		
比較例 1	MD TD	○○○○ ○○○○	○○○○ ○○○○	○○○○ ○○○○	○○○○ ○○○○	○○○○ ○○○○	6 0	4 B
比較例 2	MD TD	○○○○ ○○○○	○○○○ ○○○○	○○○○ ○○○○	○○○○ ○○○○	○○○○ ○○○○	6 0	4 B
比較例 3	MD TD	○○○○ ○○○○	○○△△ △△△△	△××× △×××	○○○○ ○○○○	△××× ××××	3 5	B
比較例 4	MD TD	○○○○ ○○○○	○○△△ △×××	×××× ××××	○○○○ ○○○○	×××× ××××	2 9	B
比較例 5	MD TD	○○○○ ○○○○	△△△△ ××××	△△×× ××××	○○○○ ○○○○	×××× ××××	2 9	B
比較例 6	MD TD	○○○○ ○○○○	○○○○ ○○○○	○○○○ ○○○○	○○○○ ○○○○	○○○○ ○○○○	6 0	3 B
比較例 7	MD TD	○○○○ ○○○○	○○△△ △△△△	△△×× ××××	○○△△ ○○△△	×××× ××××	3 0	3 B
比較例 8	MD TD	○○○○ ○○○○	○○△△ △△△△	×××× ××××	○○○○ ○○○○	×××× ××××	3 1	3 B
比較例 9	MD TD	○○○○ ○○○○	○○○○ ○○○○	○○○○ ○○○○	○○○○ ○○○○	○○○○ ○○○○	6 0	4 B
比較例 10	MD TD	○○○○ ○○○○	△××× ××××	×××× ××××	△△△△ △△△△	△××× ××××	2 0	2 B

As shown in Table 5, the resin coating metal plate of Embodiments 1-11 of this invention has good processability.

**[0086]** On the other hand, as shown in Table 6, processability also with good comparative example 1 and comparative example 2 is shown, but surface hardness (pencil hardness) is low compared with 2B of a VCM/PVC system resin coating metal plate - 3B. When the acrylic resin film 3 was extruded in thickness of 100 micrometers and rolled round after film production, tacking (conglutination) was produced on the piled-up films and there was a problem in handling nature.

**[0087]** Although processability also with the good comparative example 9 is shown, acrylic large resin of elongation after fracture is used as the coloring resin film 4. Although the thing corresponding to the Claim of this invention is used for the comparative examples 3-5 as the coloring resin film 4, their elongation after fracture of the acrylic resin film 3 is smaller than the generic claim of this invention.

**[0088]** Although the comparative example 6 has the ultraviolet-rays cover nature of the coloring resin film 4 lower than the range of Claim 3, influence does not appear in processability. Although the comparative example 7 uses the blend film of PVdF system resin and acrylic resin for the coloring resin film 4, the blend ratio does not conform to the Claim of this invention. The processability of the comparative example 7 is the comparative example 8 to which the coloring resin film 4 changes only from acrylic resin, and



processability practically equal.

[0089]3-2 <Weatherability accelerated test evaluation result of a resin coating metal plate>

[0090]

[Table 7]

	評価項目	曝露時間 (時間)		
		4000	8000	12000
実施例 1	色差 (ΔE 値)	1.0 以下	1.2	1.8
	剥離の有無	無し	無し	無し
実施例 9	色差 (ΔE 値)	1.0 以下	1.4	2.7
	剥離の有無	無し	無し	無し
実施例 10	色差 (ΔE 値)	1.0 以下	1.9	4.1
	剥離の有無	無し	無し	無し
比較例 6	色差 (ΔE 値)	1.0 以下	1.6	4.8
	剥離の有無	無し	無し	無し
比較例 7	色差 (ΔE 値)	1.0 以下	2.1	5.3
	剥離の有無	無し	無し	無し
比較例 8	色差 (ΔE 値)	1.0 以下	1.4	4.9
	剥離の有無	無し	無し	無し
比較例 9	色差 (ΔE 値)	2.2	4.4	9.8
	剥離の有無	無し	無し	無し
比較例 10	色差 (ΔE 値)	1.0 以下	1.2	3.6
	剥離の有無	無し	無し	無し

Exfoliation was generated about no samples except a comparative example in promotion exposure 12000 hours in both the interface of the coloring resin film 4 and the acrylic resin film 3, and the interface of the acrylic resin film 3 and the base metal board 1.

[0091]Discoloration mainly originates in degradation (degradation of resin itself, tenebrescence of paints, etc.) of the coloring resin film 4, and since the almost same result was obtained about the sample which uses the same coloring resin film 4, it showed the evaluation result in Table 7 only about the sample which should be observed.

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**[0092]**About all the Embodiments 1-11 of this invention, the color difference change (delta E value) 12000 hours after promotion exposure is suppressed to five or less, and exfoliation was not accepted, either. Embodiment 10 is the composition of having the adhesives layer 5 specified to Claim 3 of this invention, and the ultraviolet-rays cover nature of the coloring resin film 4 is not less than 80% of thing.

**[0093]**The comparative example 6 is lower than the value as which the ultraviolet-rays cover nature of the coloring resin film 4 is specified to Claim 3 with the same composition, the adhesives layer 5 deteriorates at the time of exposure period 12000 hours, and the coloring resin film 4 and the acrylic resin film 3 came to exfoliate.

**[0094]**Although the comparative example 9 used the film which has desirable pliability for using for the acrylic resin film 3 of this invention as the coloring resin film 4, When [ which are depended on degradation of the coloring resin film 4 surface ] it was ruined and the pollutant from the outside accumulated on this rough \*\*\*\*\* further, color difference change is large.

**[0095]**3-3 <Weatherability accelerated test evaluation result of a resin coating metal plate>

**[0096]**

**[Table 8]**

	1 年間		2 年間	
	拭取り無し	拭取り後	拭取り無し	拭取り後
比較例 1	3 . 6	1 . 0 以下	3 . 9	1 . 0 以下
比較例 9	2 . 9	1 . 0 以下	3 . 1	1 . 0 以下
比較例 10	3 . 2	1 . 0 以下	3 . 3	1 . 0 以下
比較例 6	2 . 8	1 . 0 以下	3 . 3	1 . 0 以下
比較例 7	3 . 0	1 . 6	4 . 4	2 . 1
比較例 8	2 . 9	1 . 4	4 . 1	1 . 9
比較例 9	4 . 7	2 . 5	7 . 5	6 . 1
比較例 10	2 . 8	1 . 0 以下	3 . 0	1 . 0 以下

In the outdoor exposure for two years, exfoliation was generated about no samples in both the interface of the coloring resin film 4 and the acrylic resin film 3, and the interface of the acrylic resin film 3 and the base metal board 1. An exposure point is in the situation where a fuel oil boiler is located in the neighborhood and the particulate matter under flue gas adheres to a sample surface, and although it cannot say not necessarily good conditions as an outdoor-exposure place, it shows an evaluation result as comparison of the removal

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nature of surface dirt.

**[0097]**Therefore, about the sample which uses the same coloring resin film 4, the almost same result is obtained and only the sample which should be observed also about this evaluation showed the evaluation result in Table 7.

**[0098]**The discoloration without surface wiping by exposure one year and, and two years in Embodiments 1-11 of this invention is mainly adhesion of the aforementioned flying pollutant, the color difference change (delta E value) after wiping off the surface lightly by a waste is suppressed to 1.0 or less, and decontamination nature can say that it is good.

**[0099]**It is also related with the comparative examples 1-6, and is \*\*\*\*\* by the same result. The outermost layer has decontamination nature also with the good comparative example 10 which comprised only PVdF system resin. Although the comparative examples 7 and 8 use the film which makes acrylic resin a subject as the coloring resin film 4, the color difference after wiping is a little large to the color difference before wiping seldom changing to an embodiment.

**[0100]**Even if wiped off by the comparative example 9 having a large color difference change, the pollutant was not removed thoroughly. In order to presume that surface degradation is produced like the case of an accelerated test and to improve processability, when it is used with the form which touches the atmosphere by using as a direct surface layer the acrylic resin which improved pliability, it turns out that weatherability and resistance to contamination are not so good.

**[0101]**[The overall evaluation of a resin coating metal plate]

**[0102]**

**[Table 9]**

	加工性	表面硬さ 鉛筆硬度	耐候性 促進試験	耐候性 促進試験	総合評価
実施例 1	○	○	○	○	○
実施例 2	○	○	○	○	○
実施例 3	○	○	○	○	○
実施例 4	○	○	○	○	○
実施例 5	△	○	○	○	△
実施例 6	○	○	○	○	○
実施例 7	○	○	○	○	○
実施例 8	△	○	○	○	△
実施例 9	○	○	○	○	○
実施例 10	○	○	○	○	○
実施例 11	○	○	○	○	○
比較例 1	○	×	○	○	×
比較例 2	○	×	○	○	×
比較例 3	×	○	○	○	×
比較例 4	×	○	○	○	×
比較例 5	×	○	○	○	×
比較例 6	○	○	×	○	×
比較例 7	×	○	○	×	×
比較例 8	×	○	○	×	×
比較例 9	○	×	×	×	×
比較例 10	×	○	○	○	×

The evaluation result of each embodiment and a comparative example is collectively shown in Table 9. About processability, 55 or more evaluation items were made into "O", and "\*\*\*" and less than it were made into "x" for 40 or more points [ 54 or less ]. In 23 \*\* adhesion bending, V-bending, and 0 \*\* V-bending, a problem does not produce the thing of 40 or more points, but it is judged that it has the processability of the level as for which trouble is not in roll-forming shaping.

**[0103]** Since the present VCM/PVC system resin coating metal plate was in the level of 2B - 3B about pencil hardness, "O" and the thing below it were made into "x" for the thing beyond it. [ the thing to which exfoliation was accepted by exposure 12000 hours, and else ], the weatherability accelerated test made "x" what has a remarkable color difference change, and made except [ its ] "O."

**[0104]** The color difference change after wiping made the larger thing than 1.0 "x", and the weatherability outdoor exposure test made except [ its ] "O" for exposure two years. In this embodiment, it has the following effects.

**[0105]** (1) The inside of the acrylic resin film 3 laminated on the base metal board 1, and the  
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coloring resin film 4, While the whole coloring resin film 4 comprises a layer which comprises the blended body of 60 to PVdF system resin 90 weight section, and 40 to acrylic resin 10 weight section (both sum totals are 100 weight sections) or these at least one layer of layers are included, The acrylic resin film 3 and the coloring resin film 4 have predetermined tension elongation after fracture. As a result, the resin coating metal plate excellent in the weatherability used on an outdoor type way and processability can be obtained, without using a VCM/PVC system resin layer.

**[0106]**(2) The layer 4a whose coloring resin film 4 is a blended body (both sum totals are 100 weight sections) of 60 to PVdF system resin 90 weight section, and 40 to acrylic resin 10 weight section, It contains at a time at least one layer of layers 4b which are a blended body (both sum totals are 100 weight sections) of ten to PVdF system resin 40 weight section, and 90 to acrylic resin 60 weight section. As a result, the open air side surface of a resin coating metal plate can carry out laminate integration of the coloring resin film 4 and the acrylic resin film 3 easily in the contact (what is called a doubling method) to a short-time heating roller, etc., with good weatherability maintained.

**[0107]**(3) The measured value of the ultraviolet-rays cover nature in the range of 280-400-nm wavelength measured by one half of the thickness of the thickness which the adhesives layer 5 is formed between the acrylic resin film 3 and the coloring resin film 4, and is covered to the actual condition of the coloring resin film 4 is not less than 80%. Therefore, the adhesives layer 5 which is generally easy to produce exfoliation by weather resistance deterioration is protected from ultraviolet rays, and long-term peeling resistance is acquired.

**[0108]**(4) Also when entering a crack occurs selectively in the surface coloring resin film 4 by adding paints also to the acrylic resin film 3, and coloring it, the weatherability of the part containing a crack can be prevented from falling remarkably by reducing the penetration depth of ultraviolet rays.

**[0109]**An embodiment is not limited above and may be materialized as follows, for example. O It is good also considering the coloring resin film 4 as composition of three or more layers. In this case, when changing the blend ratio of PVdF system resin and acrylic resin for each layer, and raising the blend ratio of acrylic resin as the layer near an acrylic resin film aims at adhesive improvement with an acrylic resin film, it is preferred.

**[0110]**O As paints which color the coloring resin film 4 and the acrylic resin film 3, it may replace with an inorganic pigment and an organic color may be used. However, generally, since an organic color is inferior to weatherability as compared with an inorganic pigment, its inorganic pigment is more preferred.

**[0111]**The technical idea (invention) which can be grasped from said embodiment is indicated below.

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(1) In invention given in either Claim 1 - Claim 3, said coloring resin film is a 20-100-micrometer-thick range, and said acrylic resin film is formed more thickly than this coloring resin film. In this case, on the conditions that the sum total of the thickness of a coloring resin film and an acrylic resin film is the same, the processability of a resin coating metal plate becomes good.

**[0112]**(2) In invention of a description, said acrylic resin film is also colored Claim 1 - Claim 3, and either of (1) by addition of paints.

(3) In invention of a description, the inorganic pigment is used for said paints by either Claim 1 - Claim 3, (1) and (2). The inorganic pigment can reduce the ultraviolet-rays penetration depth of a film layer as compared with an organic color.

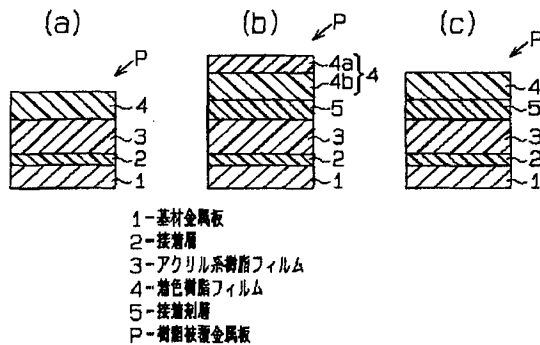
**[0113]**

**[Effect of the Invention]**As explained in full detail above, the resin coating metal plate of the invention according to claim 1 to 3 is excellent in weatherability and processability, and is excellent also in decontamination-proof nature, and can be used conveniently for an outdoor type way.

## Drawings

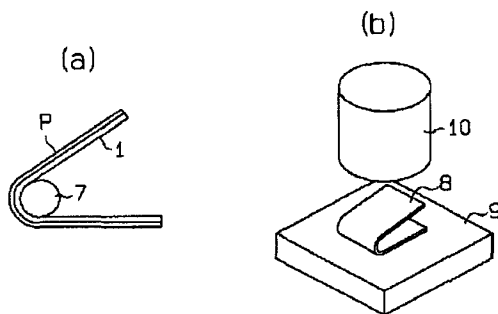
### [Brief Description of the Drawings]

#### [Drawing 1]



(a) - (c) is a type section figure of the resin coating metal plate of an embodiment.

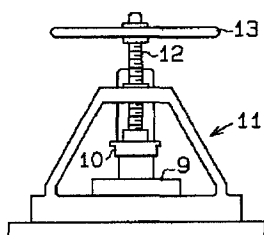
#### [Drawing 2]



As for (a), the mimetic diagram showing a reserve bending state and (b) are the pattern perspective views of shock adhesion bending.

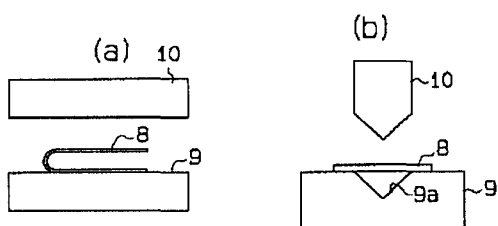
#### [Drawing 3]

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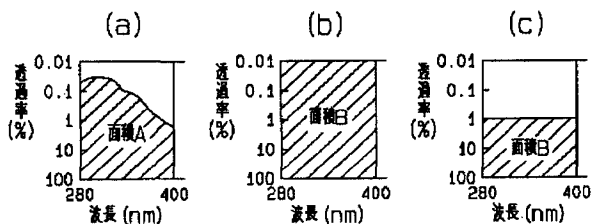
The mimetic diagram of screw bending test equipment.

[Drawing 4]



As for (a), (b) is a mimetic diagram showing adhesion aggressiveness bending, and a mimetic diagram showing V-bending.

[Drawing 5]



The explanatory view of ultraviolet-rays cover nature.

[Explanations of letters or numerals]

1 [ -- A coloring resin film, 4a, 4b / -- A layer, 5 / -- An adhesives layer, P / -- Resin coating metal plate. ] -- A base metal board, 2 -- A glue line, 3 -- An acrylic resin film, 4



## Appendix

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